**Jadara University**

**ref# FR/P1/P1/1/v1**

**جامعة جدارا**

## COURSE DESCRIPTIONS

| | | | | | |
|---|---|---|---|---|---|
| **Faculty** | Science and Information Technology | | | | |
| **Department** | Computer Science | | | **NQF level** | 6 |
| **Course Title** | Computation Theory | **Code** | 501334 | **Prerequisite** | |
| **Credit Hours** | 3 | **Theory** | 3 | **Practical** | |
| **Course Leader** | Dr. Arwa Zabian | **email** | arwa@jadara.edu.jo | | |
| **Lecturers** | Dr. Arwa Zabian | **emails** | azabian@hotmail.com | | |
| **Lecture time** | 10.00-11.30 wed/ on-line | **Classroom** | | **Attendance** | |
| **Semester** | First 2021-2022 | **Production** | 2021 | **Updated** | 2021 |

### Short Description

Theory of computation is a course dedicates to teach the student the meaning of computing. What we can do with a computer, and how it can do and why some problems are computable and some other problems are not.

### Course Objectives

1. To learn how the computer performs all the problems assigned to it
2. to study three related area are: automata, computability and complexity.

In complexity theory we classify the problems to be solved in easy and hard. In this field it is important to distinguish why a problem is classified easy and why another one is classified hard.
In computability theory we classify the problem in solvable and unsolvable.
In automata theory we define a mathematical model of computation.
For a best comprehensive of these three theories, it is important to make a precise definition of a computer. So, the computer is an abstract machine (model) has the role to solve some problems. In this course the student must arrive to a good comprehensive of this reality

### Course Intended Learning Outcomes (CILOs)

**A. Knowledge - Theoretical Understanding**

a1. Demonstrate a full understanding and mentality of Automata Theory as the basis of all computer science languages design (K1)
a2. Compare between different mathematical models studied : DFA, NFA, Regular expression, PDA, Turing machine, context free grammar(K4)

**B. Knowledge - Practical Application**

a3. Applying automata theory in designing a DFA,NFA, PDA for any regular language (K5)

**C. Skills - Generic Problem Solving and Analytical Skills**

b1. Utilize context free grammar in designing compiler/ language rules (S1)

**D. Skills - Communication, ICT, and Numeracy**

| E. Competence: Autonomy, Responsibility, and Context |
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## Teaching and Learning Methods

1- Face-to-face lectures
2- Distance Learning
3- Student assignments to study real field and provide reports

## Assessment Methods

**1- Quizzes**
**2- Assignments**
**3- Mid and final exams**

| Course Contents | | | | | |
|---|---|---|---|---|---|
| Week | Hours | CILOs | Topics | Teaching & Learning Methods | Assessment Methods |
| 1. | 1.5 | a1 | Introduction to automata, complexity theory and computation theory. Detailed and fast review of some of the mathematical notions and terminology like strings and language and proofing method. | Face to face | quiz |
| | 1.5 | | | Distance learning | |
| 2. | 1.5 | a2 | Regular language that includes finite automata, | Face to face | |
| | 1.5 | | | Distance learning | |
| 3. | 1.5 | a2 | non deterministic, regular expression | Face to face | |
| | 1.5 | | | Distance learning | |
| 4. | 1.5 | a1,a2 | Continue non deterministic, regular expression | Face to face | |
| | 1.5 | | | Distance learning | |
| 5. | 1.5 | a2 | Non regular language | Face to face | |
| | 1.5 | | | Distance learning | |
| 6. | 1.5 | a1 | Pumping lemma | Face to face | quiz |
| | 1.5 | | | Distance learning | |
| 7. | 1.5 | a2, a3 | Regular expressions , content free grammar | Face to face | quiz |
| | 1.5 | | | Distance learning | |
| 8. | 2 | a1,a2,a3 | Mid exam | Face to face | |

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|---|---|---|---|---|---|
| 9. | 1.5 | a2 | GNFA | Face to face | |
| | 1.5 | | | Distance learning | |
| 10. | 1.5 | a3, b1 | content free grammar | Face to face | |
| | 1.5 | | | Distance learning | |
| 11. | 1.5 | b1 | pushdown automata | Face to face | |
| | 1.5 | | | Distance learning | |
| 12. | 1.5 | b1 | Equivalence between context free grammar and PDA | Face to face | |
| | | | | Distance learning | |
| 13. | 3 | b1 | Turing machine | Face to face | Home work |
| 14. | 3 | b1 | Turing machine | Face to face | |
| 15. | 6 | a1,a2,a3,<br>b1 | Final exam | Face to face | |
| 16. | | | | | |

| **Infrastructure** | |
|---|---|
| **Textbook** | Introduction to the theory of computation, Michael Sipser, Course Technology –GENGAGE Learning, 2006, 2d |
| **References** | ISBN-10:0-619-21764-2 |
| **Required reading** | |
| **Electronic materials** | |
| **Other** | |

**Course Assessment Plan**

| **Assessment Method** | | **Grade** | **CILOs** | | | |
|---|---|---|---|---|---|---|
| | | | **a1** | **a2** | **a3** | **b1** |
| **First (Midterm)** | | | 17 | 3 | 10 | |
| **Second (if applicable)** | | | | | | |
| **Final Exam** | | | 10 | 10 | 15 | 15 |
| **Coursework** | | 20 | | | | |
| **Coursework assessment methods** | Assignments | | | | | |
| | Case study | | | | | |
| | Discussion and interaction | | | 2 | | |
| | Group work activities | | | | | |
| | Lab tests and assignments | | 13 | | | 5 |
| | Presentations | | | | | |
| | Quizzes | | | | | |
| **Total** | | | 40 | 15 | 25 | 20 |

## Plagiarism

Plagiarism is claiming that someone else's work is your own. The department has a strict policy regarding plagiarism and, if plagiarism is indeed discovered, this policy will be applied. Note that punishments apply also to anyone assisting another to commit plagiarism (for example by knowingly allowing someone to copy your code).

Plagiarism is different from group work in which a number of individuals share ideas on how to carry out the coursework. You are strongly encouraged to work in small groups, and you will certainly not be penalized for doing so. This means that you may work together on the program. What is important is that you have a full understanding of all aspects of the completed program. In order to allow proper assessment that this is indeed the case, you must adhere strictly to the course work requirements as outlined above and detailed in the coursework problem description. These requirements are in place to encourage individual understanding, facilitate individual assessment, and deter plagiarism.